PROJECT facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Power Plant Improvement Initiative (PPII)

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ACHIEVING NEW SOURCE PERFORMANCE STANDARDS (NSPS) THROUGH INTEGRATION OF LOW-NO_X BURNERS WITH AN OPTIMIZATION PLAN FOR BOILER COMBUSTION

CONTACT

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PARTICIPANT

Sunflower Electric Power Corporation

LOCATION

Sunflower's Holcomb Station
Finney County, KS

Description

A unique combination of high-tech combustion modifications and sophisticated control systems will be tested on a coal-fired boiler at Sunflower Electric's Holcomb Power Station in Finney County, KS, to demonstrate how new technology can reduce air emissions and save costs for ratepayers.

The U.S. Department of Energy and Sunflower Electric Power Corporation are field testing an integrated combustion optimization system that has the potential to reduce emissions of oxides of nitrogen (NO_X) from certain coal-fired electric generating units to between 0.15-0.22 lb NO_X/million Btu. This technology will decrease heat rate and increase power output by 7 MW - at much less than the cost of state-of-the-art NO_X control technology, such as selective catalytic reduction (SCR). SCR technology uses chemical additives (ammonia) and catalysts to capture better than 90% of the NO_X pollutants from a power plant's flue gas before it exits the stack.

Sunflower's 360 MWe Wall-fired Holcomb Station

Achieving New Source Performance Standards (NSPS) Through Integration of Low-NO_X Burners with an Optimization Plan for Boiler Combustion

TOTAL PROJECT FUNDING

$5,880,000

COST SHARE

DOE	$2,800,000
Participant	$3,080,000 (52%)

ADDITIONAL TEAM MEMBERS

GE Energy and Environmental Research (GE EER)
Irvine CA
(A unit of GE Power Systems)

ESTIMATED PROJECT DURATION

26 Months

CUSTOMER SERVICE

800-553-7681

WEBSITE

www.netl.doe.gov

GE Energy and Environmental Research will provide the core technologies being demonstrated at Sunflower Electric. Annual operating costs, while not fully evaluated, are not expected to be any higher than the cost of the currently installed technology. Comparative capital costs for SCR technology, however, are on the order of 4 to 5 times the cost of GE's combustion optimization system.

The Holcomb unit was originally equipped with a "first-generation" low-NO_X burner design that reduced emissions by 50% from uncontrolled emission rates. Under this demonstration program, burner design will be modified to optimize both the flame shape and the mixing of air and fuel, thereby optimizing combustion. Specific components will also be added to the boiler, including a separated overfire air (SOFA) system. SOFA allows lean-burning operation of the burners by providing for the admission of additional air above the primary combustion zone. Advanced in-furnace sensors, coal flow measuring and control devices on each burner, and a neural network or other artificially intelligent control technology will also be included. Together, the burner modifications and the installation of the SOFA system and advanced combustion optimization components will further reduce the remaining NO_X emissions by about 40%, with the SOFA system accounting for most (about three-fourths) of the 40% reduction. Boiler optimization is expected to reduce slagging (deposition of molten ash on boiler tubes) conditions and improve heat rate.

While applicable to all coal types, the low sulfur (less than 1%) and high reactivity of Powder River Basin coals lend themselves to the SOFA-based staging and inexpensive burner modifications that are at the core of the pollution reduction goals of this project.

Advanced Low-NO_X Burner - 48" Outside Diameter

Benefits

Many utilities have selected SCR to control NO_X emissions. While SCR can achieve low NO_X levels, it is expensive, difficult to retrofit, reduces efficiency, and both uses and emits ammonia. The GE Combustion Optimization System used in this project can achieve nearly the same NO_X reductions as SCR in a simple retrofit with improved efficiency, no ammonia, and increased power generation. When concluded, the Holcomb project should consistently achieve the most stringent emission limits set by federal and state New Source Performance Standards - 0.15 pounds of NO_X per million Btu.